Quarterly REPORT

(for January-June 1997)

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Enhanced Land cover and Land Cover Change products from MODIS Algorithm Development and Post Launch Studies

by

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1. At-launch Land Cover Product.

a. Task Objectives:

i) The principal objective of this task is to supply a validated at-launch land cover product based on the AVHRR at a resolution of 1 km.

ii) A subsidiary objective is to gain agreement on the classes to be used in the product.

b. Task Progress:

i) A team member (RDF) attended the IGBP-DIS Land Cover Validation Working Group meeting held in Toulouse under the chairmanship of Alan Belward. The meeting developed the plans for a workshop to bring together regional experts to derive validation data for the IGBP-DIS sponsored 1 km land cover product. The workshop is tentatively scheduled for December, 1997. A workshop has also been scheduled for Sept. 16-17, 1997 at UMD to derive a methodology for assessing the at-launch land cover product for MODIS. Participants in the workshop include the experts from EDC who developed the IGBP-DIS 1km classification as well as MODLAND Science Team members. It is likely that the validation data developed from the IGBP-DIS workshop will be used in assessing the at-launch MODIS land cover product. We plan to hold a second workshop in December, 1997 to carry out the assessment of the MODIS at-launch land cover product. Products that will be assessed include the IGBP-DIS 1 km land cover product and the 1 km land cover product currently being generated at UMD.

Using the training data available at UMD, we have carried out analysis to derive a 1 km land cover classification. We have finalized the methodology using the AVHRR Pathfinder data as a prototype.
ii) In this reporting period, we have surveying the MODLAND team members regarding the required classes to be used in the MODIS at-launch land cover product. We have concluded that the use of the classes as defined by the IGBP will fulfill the requirements of the users in most cases.

c. Anticipated Activities During the Next Quarter:

i) We expect to hold the workshops in September and December at UMD to finalize the MODIS at-launch land cover product.

ii) No activities anticipated.

2. Land cover change indicator product.

a) Task objectives

i) Generation of test data sets

ii) Production and testing of the at-launch change detection algorithm.

iii) Production and testing of post-launch change detection algorithm

b) Task progress

i) Effort was mainly directed in the rectification of the paired TM images, and the creation of the bit maps of change within the original TM data. This was then transferred to the MODIS data. Effort was focused on those areas where we had a high degree of confidence that change was occurring.

ii) Several change detection algorithms were implemented including application of methods for filtering out phenological change, Band1-Band2 space cover type identification, further refinements of the texture procedure involving several measures of spatial variability.

We also experimented with the representation of changes in terms of the magnitude and orientation of change within the greenness-brightness space. It was clear that the change angle (or direction or orientation of change) was a much more sensitive indicator of change having occurred than the magnitude.

It was clear also that achieving a satisfactory level of omission error typically led to very high errors of commission. Facing this challenge, our change detection

algorithm was designed to minimize the sum of the two types of errors.

The structures of the change detection algorithm and the associated Look-Up Tables for the MODIS Vegetation Cover Conversion product were constructed. The computer code for the product is in preparation.

iii) Preliminary analyses of the 8km data set in depicting seasonal phenology was carried out as a prototype for using changes in the previous year's vegetation index as a method of separating seasonal change from actual changes in land cover.

c) Anticipated Activities during the Next 6 months

i) Test data including both vegetation phenological changes and real vegetation cover conversions is needed to test the capability of the algorithm in separating these two types of changes. Attempts will be made to collect the improved data sets.

ii) The computer code of the MODIS VCC product will be delivered. Using the test data sets, validation of the algorithm for the product will be carried out.

iii) No work is anticipated on this sub-task.

3. Continuous fields of land cover properties.

a) Task objectives

Generation of continuous fields of land cover attributes

b) Task progress

Using AVHRR Pathfinder data as a prototype, we have developed a methodology to provide continuous fields of three types of continuous variables: (i) % bare, % herbaceous and % woody, ii) % deciduous and % evergreen, iii) % needle-leaf and % broadleaf. The methodology for locations of endmembers involves the use of linear regression based on the training data developed at UMD. Products have been developed using AVHRR Pathfinder data at 8 km resolution. We are currently applying the methodology to the 1km AVHRR data. Products will potentially be included as data planes in the MODIS at-launch land cover product.

c) Anticipated Activities during the Next Quarter

We plan to generate continuous fields using 1km AVHRR data to form part of the at-launch product depicting land cover.